

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

<input type="text"/>									
----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

ECP2036 – MICROPROCESSOR SYSTEMS AND INTERFACING (ME)

2 JUNE 2017
3.00 p.m. - 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 7 pages with 5 questions only.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

Question 1

- a) With the help of diagrams; describe the sequence of steps that took place between CPU and memory during memory read operation. (12 marks)
- b) In your own words explain the significance of the following instruction:
`MOV SP, #4FH` (4 marks)
- c) Identify and explain the functions of the following pins:
 a. Pin 20
 b. Pin 40 (4 marks)

Question 2

- a) Complete the following table;

Address	Machine Code	Instruction
0B00		MOV A, #01H
		MOV R2, #0BH
		ADD A, R2
		ANL A, #12H
		MOVC A, @A+DPTR

(10 marks)

- b) Rewrite the following machine code into its assembly language program

Address	Machine Code
0000	74 72
0002	75 F0 02
0005	95 F0
0007	70 02
0009	45 F0

(Note: Address for Accumulator is at E0H and register B is at F0H)

(10 marks)

Continued ...

Question 3

- a) List any two of the 8051's serial port modes, how they are selected and their corresponding baud rate. (6 marks)
- b) Describe and illustrate the output of the following program:

```

ORG 0100H
LOOP:SETB P1.0
    NOP
    NOP
    CLR P1.0
    SJMP LOOP
END

```

(4 marks)

- c) Write a program that writes the value 55H to port 2 and creates a high to low pulse at P3.2 once P1.4 is high. (10 marks)

Question 4

- a) Design a door security system as in Figure 4.1 using interrupts that sound a loudspeaker with 400Hz tone for 1 second whenever the door sensor makes a high to low transition. The loudspeaker is connected to P2.1 and the sensor is connected to $\overline{\text{INT0}}$.

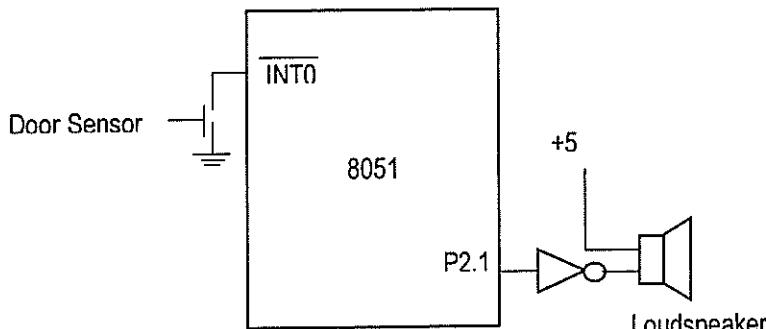


Figure 4.1: Door Security System

(15 marks)

- b) List the five interrupt sources of 8051

(5 marks)

Continued ...

Question 5

An 8051 microcontroller is interfaced to an LCD.

- a) Write the program to display “A+” with checking busy flag of the LCD. (15 marks)
- b) Draw the configuration of the system. (5 marks)

Continued ...

Appendix A Opcode Map

Code Instruction opands	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 NOP 1C	35 IBC bit, rel 2C	36 JB bit, rel 2C	37 JC bit, rel 2C	28 JNC bit, rel 2C	28 SJMP rel 2C	28 MOV Dptr, #data 2C	28 ORL C, #R 2C	28 AJMP (P1) 2C	28 ACALL (P2) 2C	28 AJMP (P3) 2C	28 ANL C, bit 2C	28 AJMP (P4) 2C	28 ACALL (P5) 2C	28 PUSH dir, C/R 2C	28 POP dir, C/R 2C	28 MOVK \$0FF, A 2C
1 AJMP (P0) 2C	28 ACALL (P1) 2C	28 AJMP (P2) 2C	28 ACALL (P3) 2C	28 AJMP (P4) 2C	28 ORL dir, A 1C	28 XRL dir, A 1C	28 ORL C, bit 2C	28 ANL C, bit 2C	28 ACALL (P5) 2C	28 MOV bit, C 2C	28 CPL C, bit 2C	28 SETB bit, C 2C	28 ACALL (P6) 2C	28 AJMP (P7) 2C	28 MOVK \$0, A 2C	
2 Ljmp address 2C	18 LCALL add16 2C	18 RETI 2C	28 ADDC A, #data 1C	28 ORL A, #data 1C	28 XRL A, #data 1C	28 MOV A, #data 1C	28 DIV AB, 4C	28 SUBB AB, 4C	18 MOVC A, @A+PC 2C	18 MOVC A, @A+DTR 2C	18 MUL AB, 4C	18 SWAP A, #data 1C	18 DA A, #data 1C	18 CLR A, #data 1C	18 MOVK \$0, A 2C	
3 RR A 1C	18 RRC A 1C	18 RLC A 1C	28 ADDC A, #data 1C	28 ORL A, #data 1C	28 XRL A, #data 1C	28 ANL A, #data 1C	28 MOV A, #data 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
4 INC A 1C	18 DEC A 1C	28 ADD A, #data 1C	28 ORL A, #data 1C	28 XRL A, #data 1C	28 ANL A, #data 1C	28 MOV A, #data 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C	
5 INC dir 1C	18 DEC \$R0 1C	28 ADD A, dir 1C	28 ORL A, dir 1C	28 XRL A, dir 1C	28 ANL A, dir 1C	28 MOV A, dir 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C	
6 INC \$R0 1C	18 DEC \$R1 1C	28 ADD A, \$R0 1C	28 ADDC A, \$R0 1C	28 ORL A, \$R0 1C	28 XRL A, \$R0 1C	28 ANL A, \$R0 1C	28 MOV A, \$R0 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
7 INC \$R1 1C	18 DEC \$R1 1C	28 ADD A, \$R1 1C	28 ADDC A, \$R1 1C	28 ORL A, \$R1 1C	28 XRL A, \$R1 1C	28 ANL A, \$R1 1C	28 MOV A, \$R1 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
8 RD 1C	18 DEC RD 1C	28 ADD A, RD 1C	28 ADDC A, RD 1C	28 ORL A, RD 1C	28 XRL A, RD 1C	28 ANL A, RD 1C	28 MOV A, RD 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
9 INC R1 1C	18 DEC R1 1C	28 ADD A, R1 1C	28 ADDC A, R1 1C	28 ORL A, R1 1C	28 XRL A, R1 1C	28 ANL A, R1 1C	28 MOV A, R1 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
A R2 1C	18 DEC R2 1C	28 ADD A, R2 1C	28 ADDC A, R2 1C	28 ORL A, R2 1C	28 XRL A, R2 1C	28 ANL A, R2 1C	28 MOV A, R2 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
B R3 1C	18 DEC R3 1C	28 ADD A, R3 1C	28 ADDC A, R3 1C	28 ORL A, R3 1C	28 XRL A, R3 1C	28 ANL A, R3 1C	28 MOV A, R3 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
C R4 1C	18 DEC R4 1C	28 ADD A, R4 1C	28 ADDC A, R4 1C	28 ORL A, R4 1C	28 XRL A, R4 1C	28 ANL A, R4 1C	28 MOV A, R4 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
D RS 1C	18 DEC RS 1C	28 ADD A, RS 1C	28 ADDC A, RS 1C	28 ORL A, RS 1C	28 XRL A, RS 1C	28 ANL A, RS 1C	28 MOV A, RS 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
E R6 1C	18 DEC R6 1C	28 ADD A, R6 1C	28 ADDC A, R6 1C	28 ORL A, R6 1C	28 XRL A, R6 1C	28 ANL A, R6 1C	28 MOV A, R6 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C
F R7 1C	18 DEC R7 1C	28 ADD A, R7 1C	28 ADDC A, R7 1C	28 ORL A, R7 1C	28 XRL A, R7 1C	28 ANL A, R7 1C	28 MOV A, R7 1C	28 DIV AB, 4C	28 SUBB AB, 4C	28 MOVC A, @A+PC 2C	28 MOVC A, @A+DTR 2C	28 MUL AB, 4C	28 SWAP A, #data 1C	28 DA A, #data 1C	28 CLR A, #data 1C	28 MOVK \$0, A 2C

The 8051 Cookbook: A Comprehensive Guide to Architecture, Programming and Interfacing, 2nd Edition
Continued ...

Appendix B
Special Function Registers

TMOD (TIMER MODE REGISTER):

7	6	5	4	3	2	1	0
GATE	C/T	M1	M0	GATE	C/T	M1	M0

TCON (TIMER/COUNTER CONTROL REGISTER):

7	6	5	4	3	2	1	0
TF1	TR1	TF0	TR0	IE1	IT1	IE0	IT0

SCON (SERIAL PORT CONTROL REGISTER):

7	6	5	4	3	2	1	0
SM0	SM1	SM2	REN	TB8	RB8	TI	RI

IE (INTERRUPT ENABLE REGISTER):

7	6	5	4	3	2	1	0
EA	-	ET2	ES	ET1	EX1	ET0	EX0

IP (INTERRUPT PRIORITY REGISTER):

7	6	5	4	3	2	1	0
-	-	PT2	PS	PT1	PX1	PT0	PX0

T2CON (TIMER/COUNTER CONTROL REGISTER)::

7	6	5	4	3	2	1	0
TF2	EXF2	RCLK	TCLK	EXEN2	TR2	C/T2	CP/RL2

PSW (PROGRAM STATUS WORD):

7	6	5	4	3	2	1	0
CY	AC	F0	RS1	RS0	OV	-	P

Continued ...

Appendix C
LCD Command Codes

Code (Hex)	Command to LCD
01	Clear display screen
02	Return home
04	Decrement cursor (shift cursor to left)
06	Increment cursor (shift cursor to right)
05	Shift display right
07	Shift display left
08	Display off, cursor off
0A	Display off, cursor on
0C	Display on, cursor off
0E	Display on, cursor blinking
0F	Display off, cursor blinking
10	Shift cursor position to left
14	Shift cursor position to right
18	Shift the entire display to left
1C	Shift the entire display to right
80	Force cursor to beginning of 1 st line
C0	Force cursor to beginning of 2 nd line
38	2 lines and 5x7 matrix

End of Page